PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-208447

(43)Date of publication of application : 26.07.2002

(51)Int.Cl. H01R 11/01
H01B 5/16
H01B 13/00
H01R 13/03
H01R 33/76
H01R 43/00

(21)Application number : 2001-005490

(22)Date of filing : 12.01.2001

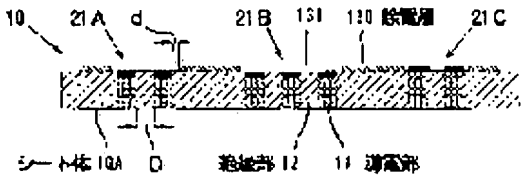
(71)Applicant : JSR CORP

(72)Inventor : YAMADA ONORI
KIMURA KIYOSHI

(54) ANISOTROPIC CONDUCTIVE SHEET AND METHOD OF MANUFACTURING THE SAME

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an anisotropic conductive sheet, prevented or restricted from electrification caused by the generation of static electricity on its one surface when peeling the anisotropic conductive sheet from a circuit base board to which an electronic device or the like is connected, and unnecessary to eliminate static electricity from the anisotropic conductive sheet by suspending the testing operation, for example, when using the anisotropic conductive sheet for an electrical test of a circuit device like a printed circuit board or an integrated circuit, and enables to carry out the electrical test with high efficiency.



SOLUTION: The anisotropic conductive sheet comprises an anisotropic conductive sheet main body on which a plurality of elastic conductive path forming parts, extending in the direction of the thickness, are arranged in the state of being insulated from each other by insulation parts, contact point members integrally formed on the surface of the conductive path forming parts of the anisotropic conductive sheet main body,

and a static electricity eliminating layer integrally formed on at least one surface of the sheet body.

LEGAL STATUS

[Date of request for examination]	28.02.2003
[Date of sending the examiner's decision of rejection]	13.09.2005
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	
[Date of registration]	
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the anisotropic conductive sheet preferably used for the connector in the test equipment of circuit apparatus, such as electrical installation between circuit apparatus, such as electronic parts, and a printed circuit board, a semiconductor integrated circuit, etc., and its manufacture approach.
[0002]
[Description of the Prior Art] That an anisotropic conductive elastomer sheet indicates conductivity to be only in the thickness direction, Or it is possible to attain compact electrical installation, without not having the pressurization conductivity current carrying part which shows conductivity only in the thickness direction, when pressurized in the thickness direction, and using means, such as soldering or mechanical fitting, Since a mechanical impact and a mechanical strain are absorbed and it has the features, like soft connection is possible, It sets in fields, such as a computer, an electronic formula digital clock, an electronic camera, and a computer keyboard, using such features. It is widely used as a connector for attaining the mutual electric connection with a circuit apparatus, for example, a printed circuit board and a lead loess chip carrier, a liquid crystal panel, etc.
[0003] Moreover, in electric inspection of circuit apparatus, such as a printed circuit board and a semiconductor integrated circuit, in order to attain the electric connection between the inspected electrode of the circuit apparatus which is a subject of examination formed in the whole surface at least, and the checking electrode formed in the front face of the checking circuit board, making an anisotropic conductive elastomer sheet intervene between the inspected electrode field of a circuit apparatus and the checking electrode field of the checking circuit board is performed.
[0004] As such an anisotropic conductive elastomer sheet, conventionally The thing of various structures is known. To JP,51-93393,A The anisotropic conductive elastomer sheet which distributes metal particles in an elastomer at homogeneity, and is obtained is indicated. To JP,53-147772,A By distributing an ununiformity in an elastomer, a conductive magnetic-substance particle The anisotropic conductive elastomer sheet with which it comes to form the track formation section of a large number extended in the thickness direction and the insulating section which insulates these mutually is indicated. Furthermore, the anisotropic conductive elastomer sheet with which the level difference was formed between the front face of the track formation section and the insulating section is indicated by JP,61-250906,A.
[0005]
[Problem(s) to be Solved by the Invention] However, although an anisotropic conductive sheet has conductivity in the thickness direction, since it is what has insulation in the direction of a field, depending on the operation and operating environment, static electricity is arisen and charged on the front face of the anisotropic conductive sheet concerned, and various problems produce it. For example, if it arises and charges static electricity on the front face of an anisotropic conductive sheet in using an anisotropic conductive sheet for electric inspection of a circuit apparatus, since the circuit apparatus

which is a subject of examination will stick to an anisotropic conductive sheet with the attraction by the static electricity concerned, it becomes difficult to conduct inspection smoothly. Moreover, when static electricity of a high electrical potential difference was accumulated in the front face of an anisotropic conductive sheet, it is inconvenient in respect of reservation of an operator's safety, and static electricity of a very high electrical potential difference is accumulated especially, and the static electricity concerned discharges, failure may arise in the circuit apparatus which is test equipment, an anisotropic conductive sheet, or a subject of examination. Since it is such, in electric inspection of a circuit apparatus, there is a problem that interrupt inspection if needed, and it is required to do the electric discharge activity of an anisotropic conductive sheet using an electric discharge brush etc., therefore a patient throughput falls when generating of static electricity is periodically observed on the front face of an anisotropic conductive sheet.

[0006] This invention is made based on the above situations, and the 1st purpose is in offering the anisotropic conductive sheet which can prevent or control that static electricity is arisen and charged on a front face. The 2nd purpose of this invention is to offer the approach that the anisotropic conductive sheet which can prevent or control that static electricity is arisen and charged on a front face can be manufactured.

[0007]

[Means for Solving the Problem] It is characterized by the anisotropic conductive sheet of this invention coming to have the electric discharge layer in which the anisotropic conductive sheet object which has conductivity, and this sheet object were established in the thickness direction in one at least at the whole surface.

[0008] Moreover, the anisotropic conductive sheet of this invention is characterized by having the anisotropic conductive sheet object which it comes to arrange after two or more current carrying parts extended in the thickness direction have been mutually insulated by the insulating section, the contact member prepared in the front face of the track formation section in this body of an anisotropic conductive sheet, and the electric discharge layer in which this sheet object was prepared in the whole surface in one at least. As for said electric discharge layer, in such an anisotropic conductive sheet, it is desirable to be prepared in the insulating section in a sheet object. Moreover, even if there is little insulating section in said sheet object, the hollow is formed in the whole surface and the electric discharge layer may be prepared in this hollow.

[0009] As for said sheet object, in the anisotropic conductive sheet of this invention, it is desirable to have the conductive particle contained where orientation is carried out so that it may stand in a line in the thickness direction. As for a contact member, it is desirable to have pasted the front face of the track formation section in the body of an anisotropic conductive sheet. Moreover, as for a contact member, it is desirable that it is in the condition that the whole surface side was embedded in the track formation section. As for a contact member, it is desirable to be prepared in one on the track formation section in said body of a sheet through the conductive glue line which comes to distribute conductive powder into hardenability resin. Moreover, as for the track formation section, it is desirable that the front face is in the condition projected from the front face of the insulating section.

[0010] In the anisotropic conductive sheet of this invention, the thing which comes to contain a conductive organic substance can be used as said electric discharge layer. Moreover, the thing which comes to contain the amine system organic conductivity matter can be used as said electric discharge layer. Moreover, the thing which comes to contain a metal can be used as said electric discharge layer. Moreover, the thing which comes to contain carbon black can be used as said electric discharge layer. Moreover, what consists of a metal layer can be used as said electric discharge layer. Moreover, the thing which the conductive matter comes to contain can be used as said electric discharge layer into the binder which consists of an organic substance. Moreover, the thing which a conductive organic substance comes to contain can be used into thermoplastics as said electric discharge layer. Moreover, what consists of a conductive polymer can be used as said electric discharge layer.

[0011] The manufacture approach of the anisotropic conductive sheet of this invention is characterized by having the process which forms an electric discharge layer by preparing the fluid constituent for

electric discharge stratification which comes to contain the conductive matter, applying this constituent for electric discharge stratification to a sheet object, forming a paint film, and performing fixing processing to the paint film concerned after that.
[0012] Moreover, the manufacture approach of the anisotropic conductive sheet of this invention is characterized by having the process which forms an electric discharge layer by preparing the fluid constituent for electric discharge stratification which comes to contain the conductive matter and the hardenability ingredient used as a binder or a binder, applying this constituent for electric discharge stratification to a sheet object, forming a paint film, and performing desiccation processing and/or hardening processing to the paint film concerned after that.
[0013] Moreover, the manufacture approach of the anisotropic conductive sheet of this invention is characterized by having the process which forms an electric discharge layer by manufacturing the film for electric discharge layers which should serve as an electric discharge layer, and pasting up this film for electric discharge layers on a sheet object.
[0014] Moreover, the manufacture approach of the anisotropic conductive sheet of this invention is characterized by having the process which forms the electric discharge layer which consists of a metal layer by carrying out plating processing of a metal to a sheet object.
[0015] Moreover, the manufacture approach of the anisotropic conductive sheet of this invention forms an electric-discharge layer and the layer which should become in the shaping side of the metal mold for fabricating a sheet object, pours in the sheet object molding material which a conductive particle comes to contain in the macromolecule formation ingredient which is hardened in this metal mold after that, and serves as an elastic high polymer, forms a molding material layer, and is characterized by to have the process which carries out the hardening processing of the molding material layer concerned. In such a manufacture approach, after making [or] a magnetic field act, making a magnetic field act on the molding material layer formed in metal mold, it is desirable to carry out hardening processing of the molding material layer concerned.
[0016]
[Function] According to the above-mentioned configuration, since the electric discharge layer is prepared in the whole surface of an anisotropic conductive sheet object, it can prevent or control that static electricity is arisen and charged on the whole surface of an anisotropic conductive sheet by grounding the electric discharge layer concerned.
[0017]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail.
<Anisotropic conductive sheet> [0018]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail.
<Gestalt of the 1st operation> Drawing 1 is the sectional view for explanation showing the configuration of the important section in the gestalt of the 1st operation concerning the anisotropic conductive sheet of this invention. This anisotropic conductive sheet has the body 10 of an anisotropic conductive sheet which consists of two or more track formation sections 11 extended in the thickness direction, respectively, and the insulating section 12 which insulates these track formation sections 11 mutually. Each of the track formation section 11 in this body 10 of an anisotropic conductive sheet is constituted by the conductive ingredient which has elasticity, and is arranged according to the pattern corresponding to the pattern of the electrode for connection along the direction of a field of the body 10 of an anisotropic conductive sheet concerned. And the contact member 30 by which thermocompression bonding was carried out is formed in the front face of each track formation section 11. Moreover, the anisotropic conductive sheet of this invention comes to have the anisotropic conductive sheet object which has conductivity, and the electric discharge layer of this sheet object prepared in the whole surface at least in the thickness direction. This electric discharge layer may be formed covering the whole whole surface of a sheet object, and may be formed in some [in the whole surface of a sheet object] fields. And the electric discharge layer 130 is formed in the front face of the insulating section

12.
[0019] In the gestalt of this 1st operation, each of the track formation section 11 has bigger thickness than the insulating section 12, and both that front face is in the condition projected from both the front faces of the insulating section 12. Moreover, the outer diameter r of each of a contact member 30 is smaller than the outer diameter R of the track formation section 11, and it is in the condition which the amount of field flank projected from the front face of the track formation section 11 concerned while the amount of the whole surface flank is moreover in the condition embedded in the track formation section 11 in the body 10 of an anisotropic conductive sheet. Here, in order that a contact member 30 may acquire a high adhesive property to the track formation section 11, as for the embedding depth d1 to the track formation section 11 of a contact member 30, it is desirable that it is 10% or more of the thickness of a contact member 30.
[0020] A conductive particle contains the track formation section 11 in the body 10 of an anisotropic conductive sheet in an insulating elastic high polymer, and it is constituted, preferably, into the elastic high polymer, where a conductive particle is located in a line in the thickness direction, orientation is carried out, and a track is formed in the thickness direction of the track formation section concerned of this conductive particle. This track formation section 11 can also be made into the pressurization track formation section in which resistance decreases and a track is formed when pressurized and compressed in the thickness direction.
[0021] As an insulating elastic high polymer used for the track formation section 11, the high polymer which has the structure of cross linkage is desirable. As a high polymer formation ingredient of hardenability which can be used in order to obtain the crosslinked polymer matter Various things can be used. As the example Polybutadiene rubber, natural rubber, polyisoprene rubber, styrene-butadiene copolymer rubber, Conjugated diene system rubber and these hydrogenation objects, such as acrylonitrile-butadiene copolymer rubber, Block-copolymer rubber and these hydrogenation objects, such as styrene-butadiene-diene block-copolymer rubber and a styrene-isoprene block copolymer, A chloroprene, polyurethane rubber, polyester system rubber, epichlorohydrin rubber, silicone rubber, ethylene-propylene copolymer rubber, ethylene-propylene-diene copolymer rubber, etc. are mentioned. When weatherability is required of the anisotropic conductive sheet obtained above, it is desirable to use things other than conjugated diene system rubber, and it is desirable to use silicone rubber from a viewpoint of fabrication nature and an electrical property especially.
[0022] As silicone rubber, what constructed for it the bridge or condensed liquefied silicone rubber is desirable. For liquefied silicone rubber, the viscosity is 105 at strain rate 10-1sec. The following [a poise] may be desirable and may be any, such as a thing of a condensation mold, a thing of an addition mold, and a thing containing a vinyl group or hydroxyl. Specifically, dimethyl silicone crude rubber, methylvinyl silicone crude rubber, methylphenyl vinyl silicone crude rubber, etc. can be mentioned.
[0023] The liquefied silicone rubber (vinyl group content poly dimethylsiloxane) which contains a vinyl group in these is usually obtained in dimethyldichlorosilane or dimethyl dialkoxysilane by performing hydrolysis and judgment carrying out a condensation reaction, for example, according to the repeat of dissolution-precipitate succeedingly to the bottom of existence of dimethyl vinyl chlorosilicane or dimethyl vinyl alkoxysilane. Moreover, the liquefied silicone rubber which contains a vinyl group in both ends carries out the anionic polymerization of cyclosiloxane like octamethylcyclotetrasiloxane to the bottom of existence of a catalyst, and is obtained by choosing suitably other reaction conditions (for example, the amount of cyclosiloxane and the amount of a terminator), using for example, a dimethyl divinyl siloxane as a terminator. Here, as a catalyst of anionic polymerization, alkali or these SHIRANO rate solutions, such as tetramethylammonium hydroxide and hydroxylation n-butyl phosphonium, etc. can be used, and reaction temperature is 80-130 degrees C. Such vinyl group content poly dimethylsiloxane is the molecular weight Mw (standard polystyrene equivalent weight average molecular weight is said.). It is below the same. It is desirable that it is the thing of 10000-40000. moreover, the molecular-weight-distribution characteristic (the ratio of the standard polystyrene equivalent weight mean molecular weight Mw and the standard polystyrene conversion number average molecular weight Mn -- the value of Mw/Mn is said.) from a heat-resistant viewpoint of the track

component obtained It is below the same. 2.0 or less thing is desirable.
[0024] On the other hand, the liquefied silicone rubber (hydroxyl content poly dimethylsiloxane) containing hydroxyl is usually obtained in dimethyldichlorosilane or dimethyl dialkoxysilane by performing hydrolysis and judgment carrying out a condensation reaction, for example, according to the repeat of dissolution-precipitate succeedingly to the bottom of existence of dimethyl hydronalium chlorosilicane or dimethyl hydronalium alkoxysilane. Moreover, the anionic polymerization of the cyclosiloxane is carried out to the bottom of existence of a catalyst, and it is obtained also by choosing suitably other reaction conditions (for example, the amount of cyclosiloxane and the amount of a terminator), using for example, dimethyl hydronalium chlorosilicane, methyl dihydrochlorosilicane, or dimethyl hydronalium alkoxysilane as a terminator. Here, as a catalyst of anionic polymerization, alkali or these SHIRANO rate solutions, such as tetramethylammonium hydroxide and hydroxylation n-butyl phosphonium, etc. can be used, and reaction temperature is 80-130 degrees C. As for such hydroxyl content poly dimethylsiloxane, it is desirable that the molecular weight Mw is the thing of 10000-40000. Moreover, since the outstanding thermal resistance is obtained, two or less thing has a desirable molecular-weight-distribution characteristic. this invention is started -- it can set body of anisotropic conductive sheet 10, either the above-mentioned vinyl group content poly dimethylsiloxane and hydroxyl content poly dimethylsiloxane can also be used, and both can also be used together.
[0025] It is desirable to use a conductive magnetic-substance particle from a viewpoint to which the orientation of the particle concerned can be made to carry out in the thickness direction of the body 10 of an anisotropic conductive sheet easily as a conductive particle used for the track formation section 11 by the approach on which magnetism is made to act. The particle which contains the particle of the metal in which the magnetism of nickel, iron, cobalt, etc. is shown, the particles of these alloys, or these metals as an example of this conductive magnetic-substance particle, These particles are made into a heart particle. On the front face of the heart particle concerned Or gold, silver, palladium, A mineral matter particle or polymer particles, such as a thing which plated conductive good metals, such as a rhodium, a non-magnetic metal particle, or a glass bead, are made into a heart particle. What covered both the conductive magnetic substance and a conductive good metal is mentioned to the thing which plated the conductive magnetic substance, such as nickel and cobalt, on the front face of the heart particle concerned, or a heart particle. In these, it is desirable to use what made the nickel particle the heart particle and plated the conductive good metal of gold, silver, etc. on the front face. Although not limited to the front face of a heart particle especially as a means to cover a conductive metal, chemical plating or electroless deposition can be used, for example.
[0026] When using the thing with which the front face of a heart particle comes to cover a conductive metal as a conductive particle, it is 47 - 95% that the coverage (the covering surface product of a conductive metal to the surface area of a heart particle comparatively) of the conductive metal in the particle front face from a viewpoint on which good conductivity is acquired is 40% or more especially preferably 45% or more desirable still more preferably. Moreover, the amount of covering of a conductive metal is 4 - 20 % of the weight especially preferably three to 25% of the weight still more preferably one to 30% of the weight more preferably [it is desirable that it is 0.5 - 50% of the weight of a heart particle, and]. When the conductive metal covered is gold, the amount of covering is 4 - 10 % of the weight especially preferably 3.5 to 15% of the weight still more preferably three to 20% of the weight more preferably [it is desirable that it is 2.5 - 30% of the weight of a heart particle, and]. Moreover, when the conductive metal covered is silver, the amount of covering is 6 - 20 % of the weight especially preferably five to 30% of the weight still more preferably four to 40% of the weight more preferably [it is desirable that it is 3 - 50% of the weight of a heart particle, and].
[0027] Moreover, 2-500 micrometers of 5-300 micrometers of particle diameter of a conductive particle are 10-200 micrometers especially preferably still more preferably more preferably [it is desirable that it is 1-1000 micrometers, and]. moreover, the particle size distribution (Dw/Dn) of a conductive particle is 1-10 -- desirable -- more -- desirable -- 1.01-7 -- further -- desirable -- 1.05-5 -- it is 1.1-4 especially preferably. By using the conductive particle with which are satisfied of such conditions, the track formation section 11 obtained becomes what has easy pressurization deformation, and electric contact

sufficient between conductive particles is acquired in the track formation section 11 concerned. Moreover, although especially the configuration of a conductive particle is not limited, it is the point which can be easily distributed in the charge of high polymer material, and it is desirable that it is the massive thing to depend on the secondary particle which a spherical thing, a stellate-like thing, or these condensed.

[0028] Moreover, the water content of a conductive particle is 1% or less especially preferably 2% or less still more preferably 3% or less more preferably [it is desirable that it is 5% or less, and]. In case hardening processing of the ingredient layer for high polymers is carried out by using the conductive particle with which are satisfied of such conditions, it is prevented or controlled that air bubbles arise in the ingredient layer for high polymers concerned.

[0029] Moreover, that by which the front face was processed by coupling agents, such as a silane coupling agent, can be suitably used as a conductive particle. By processing the front face of a conductive particle by the coupling agent, the adhesive property of the conductive particle and an elastic high polymer concerned becomes high, consequently the track formation section 11 obtained becomes what has the high endurance in use of a repeat. Although the amount of the coupling agent used is suitably chosen in the range which does not affect the conductivity of a conductive particle, it is desirable that it is the amount from which the coverage (the covering surface product of the coupling agent to the surface area of a conductive heart particle comparatively) of the coupling agent in a conductive particle front face becomes 5% or more, and it is an amount from which the above-mentioned coverage becomes 20 - 100% preferably especially 10 to 100% still more preferably 7 to 100% more preferably.

[0030] As for such a conductive particle, it is desirable to contain in the track formation section 11 at a rate which becomes 25 - 40% preferably 20 to 60% with a volume fraction. When this percentage is less than 20%, the track formation section 11 with a fully small electric resistance value may not be obtained. On the other hand, when this rate exceeds 60%, the track formation section 11 obtained will tend to become brittle, and elasticity required as the track formation section 11 may not be acquired.

[0031] The insulating section 12 in the body 10 of an anisotropic conductive sheet is constituted by the elastic high polymer which has insulation. As a high polymer formation ingredient of hardenability which can be used in order to obtain this elastic high polymer Polybutadiene rubber, natural rubber, polyisoprene rubber, styrene-butadiene copolymer rubber, Conjugated diene system rubber and these hydrogenation objects, such as acrylonitrile-butadiene copolymer rubber, Block-copolymer rubber and these hydrogenation objects, such as styrene-butadiene-diene block-copolymer rubber and a styrene-isoprene block copolymer, A chloroprene, polyurethane rubber, polyester system rubber, epichlorohydrin rubber, When silicone rubber, ethylene-propylene copolymer rubber, ethylene-propylene-diene copolymer rubber, etc. are mentioned and weatherability is required of the anisotropic conductive sheet obtained, it is desirable to use things other than conjugated diene system rubber.

[0032] When weatherability is required of the anisotropic conductive sheet obtained above, it is desirable to use things other than conjugated diene system rubber, and it is desirable to use silicone rubber from a viewpoint of fabrication nature and an electrical property especially.

[0033] That in which what is used for said track formation section could use it suitably, and constructed for it the bridge or condensed liquefied silicone rubber as silicone rubber is desirable. For liquefied silicone rubber, the viscosity is 105 at strain rate 10-1sec. The following [a poise] may be desirable and may be any, such as a thing of a condensation mold, a thing of an addition mold, and a thing containing a vinyl group or hydroxyl. Specifically, dimethyl silicone crude rubber, methylvinyl silicone crude rubber, methylphenyl vinyl silicone crude rubber, etc. can be mentioned.

[0034] The liquefied silicone rubber (vinyl group content poly dimethylsiloxane) which contains a vinyl group in these is usually obtained in dimethyldichlorosilane or dimethyl dialkoxysilane by performing hydrolysis and judgment carrying out a condensation reaction, for example, according to the repeat of dissolution-precipitate succeedingly to the bottom of existence of dimethyl vinyl chlorosilicane or dimethyl vinyl alkoxysilane. Moreover, the liquefied silicone rubber which contains a vinyl group in both ends carries out the anionic polymerization of cyclosiloxane like octamethylcyclotetrasiloxane to

the bottom of existence of a catalyst, and is obtained by choosing suitably other reaction conditions (for example, the amount of cyclosiloxane and the amount of a terminator), using for example, a dimethyl divinyl siloxane as a terminator. Here, as a catalyst of anionic polymerization, alkali or these SHIRANO rate solutions, such as tetramethylammonium hydroxide and hydroxylation n-butyl phosphonium, etc. can be used, and reaction temperature is 80-130 degrees C. Such vinyl group content poly dimethylsiloxane is the molecular weight Mw (standard polystyrene equivalent weight average molecular weight is said.). It is below the same. It is desirable that it is the thing of 10000-40000. moreover, the molecular-weight-distribution characteristic (the ratio of the standard polystyrene equivalent weight mean molecular weight Mw and the standard polystyrene conversion number average molecular weight Mn -- the value of Mw/Mn is said.) from a heat-resistant viewpoint of the track component obtained It is below the same. 2.0 or less thing is desirable.

[0035] On the other hand, the liquefied silicone rubber (hydroxyl content poly dimethylsiloxane) containing hydroxyl is usually obtained in dimethyldichlorosilane or dimethyl dialkoxysilane by performing hydrolysis and judgment carrying out a condensation reaction, for example, according to the repeat of dissolution-precipitate succeedingly to the bottom of existence of dimethyl hydronalium chlorosilicane or dimethyl hydronalium alkoxysilane. Moreover, the anionic polymerization of the cyclosiloxane is carried out to the bottom of existence of a catalyst, and it is obtained also by choosing suitably other reaction conditions (for example, the amount of cyclosiloxane and the amount of a terminator), using for example, dimethyl hydronalium chlorosilicane, methyl dihydrochlorosilicane, or dimethyl hydronalium alkoxysilane as a terminator. Here, as a catalyst of anionic polymerization, alkali or these SHIRANO rate solutions, such as tetramethylammonium hydroxide and hydroxylation n-butyl phosphonium, etc. can be used, and reaction temperature is 80-130 degrees C. As for such hydroxyl content poly dimethylsiloxane, it is desirable that the molecular weight Mw is the thing of 10000-40000. Moreover, 2.0 or less thing has the heat-resistant viewpoint of the track component obtained to a desirable molecular-weight-distribution characteristic. In this invention, either the above-mentioned vinyl group content poly dimethylsiloxane and hydroxyl content poly dimethylsiloxane can also be used, and both can also be used together.

[0036] In this invention, in order to stiffen a high polymer formation ingredient, a proper curing catalyst can be used. As such a curing catalyst, organic peroxide, a fatty-acid azo compound, a hydrosilylation catalyst, etc. can be used. As an example of the organic peroxide used as a curing catalyst, a benzoyl peroxide, peroxidation BISUJI cyclo benzoyl, peroxidation JIKUMIRU, peroxidation JITA challis butyl, etc. are mentioned. Azobisisobutyronitril etc. is mentioned as an example of the fatty-acid azo compound used as a curing catalyst. Although it can be used as a catalyst of a hydrosilylation reaction, as an example, well-known things, such as complex of the complex of the complex of chloroplatinic acid and its salt, platinum-partial saturation radical content siloxane complex, the complex of a vinyl siloxane and platinum, platinum, and 1 and 3-divinyl tetramethyl disiloxane, the Tori ORGANO phosphine or phosphite, and platinum, an acetyl acetate platinum chelate, and annular diene and platinum, are mentioned. Although the amount of the curing catalyst used is suitably chosen in consideration of the class of high polymer formation ingredient, the class of curing catalyst, and other hardening processing conditions, it is usually 3 - 15 weight section to the high polymer formation ingredient 100 weight section.

[0037] Moreover, inorganic fillers, such as the usual silica powder, colloidal silica, an aerogel silica, and an alumina, can be made to contain in the base material of a sheet object if needed. The thixotropy of the molding material for acquiring a sheet object by making such an inorganic filler contain is secured, the viscosity becomes high, and moreover, while the distributed stability of a conductive particle improves, the sheet object which has high reinforcement is acquired. Although it is not limited, since it becomes impossible to fully attain the orientation of the conductive particle by the magnetic field when especially the amount of such inorganic filler used is used so much, it is not desirable.

[0038] The thing of the class same as an elastic high polymer which constitutes the insulating section 12 as the elastic high polymer which constitutes the track formation section 11, or a different thing of a class can be used. Moreover, the insulating sections 12 may be the track formation section 11 and one,

and may be the things of another object.
[0039] The thickness of the body 10 of an anisotropic conductive sheet is 0.1-2mm, and is 0.2-1mm preferably. Moreover, the outer diameter R of the track formation section 11 is 0.02-1mm, and is 0.05-0.5mm preferably.
[0040] Conductive ingredients, such as what consists of metals, such as what consists of the organic substance, such as a conductive polymer, a thing which consists of a constituent with which the metal was mixed by this, a metal sheet, or a metal membrane, as a contact member 30, can be used. Also in these, at the point which can break through certainly the oxide film formed in the front face of the electrode for connection, it is desirable to use what consists of metals, such as a metal sheet or a metal membrane, and it can use copper, gold, a rhodium, platinum, palladium, nickel, those plating, or those alloys as an example of this metal. Such a contact member 30 may be constituted by layered products, such as for example, a nickel layer / copper layer / gold layer. Moreover, the thickness of a contact member 30 is 0.01-0.5mm, and is 0.025-0.1mm preferably.
[0041] The above anisotropic conductive sheet can be manufactured by the following approaches. First, the body 10 of an anisotropic conductive sheet can be formed by using for example, the body shaping metal mold of an anisotropic conductive sheet.
[0042] It is the thing of the structure which can carry out heat hardening of the ingredient layer concerned while making a magnetic field act on the ingredient layer with which consisted of a punch which the whole configuration of the body molding die of the above-mentioned anisotropic conductive sheet is abbreviation plate-like, respectively, and corresponds mutually, and female mold, and was constituted possible [wearing on an electromagnet] for a punch and female mold, or was constituted in [as an electromagnet] one, and it filled up in shaping space. In order to form the part which a magnetic field is made to act on an ingredient layer, and has conductivity in a proper location, moreover, both the punch in the body shaping metal mold of an anisotropic conductive sheet or a punch, and female mold The layer which arranged the ferromagnetic part which consists of iron for making the magnetic field in metal mold produce intensity distribution on the substrate which consists of ferromagnetics, such as iron and nickel, nickel, etc., and the non-magnetic-material part which consists of non-magnetic metal or resin, such as copper, in the shape of a mosaic (it is hereafter called a "mosaic layer".) It is the thing of a configuration of having and has slight irregularity corresponding to the current carrying part of the body 10 of an anisotropic conductive sheet which the shaping side of a punch and female mold is flat, or should be formed.
[0043] According to the body shaping metal mold of an anisotropic conductive sheet of the above configuration, the magnetic field which has intensity distribution with an electromagnet to an ingredient layer can be formed. And in such body shaping metal mold of an anisotropic conductive sheet, arrangement with the ferromagnetic part and non-magnetic-material part in a mosaic layer, a configuration, etc. are determined based on the anisotropic conductive sheet which should be fabricated. That is, a ferromagnetic part is arranged in the part equivalent to the track formation section 11 of the body 10 of an anisotropic conductive sheet acquired, and the configuration of the ferromagnetic part suits the cross-section configuration of the track formation section 11.
[0044] As an approach both the front faces of the track formation section 11 as shown in drawing 2 manufacture the body 10 of an anisotropic conductive sheet in the condition of having projected from both the front faces of the insulating section 12, using the above body shaping metal mold of an anisotropic conductive sheet For example, in the shaping space concerned of the body shaping metal mold of an anisotropic conductive sheet which has the shaping space which suited the body 10 of an anisotropic conductive sheet to form Into the high polymer ingredient which is hardened and serves as an elastic high polymer, pour in the molding material which the conductive particle which shows magnetism comes to contain, and a molding material layer is formed. The magnetic field which has intensity distribution in that thickness direction to this molding material layer is made to act. Move a conductive particle according to an operation of the magnetism, and the part used as the track formation section 11 in the body 10 of an anisotropic conductive sheet acquired is gathered. Furthermore, the approach of forming the body 10 of an anisotropic conductive sheet is mentioned by carrying out

orientation of the conductive particle so that it may stand in a line in the thickness direction, hardening the anisotropic conductive sheet molding material layer concerned in the condition, and making this release from mold from the body shaping metal mold of an anisotropic conductive sheet concerned.
[0045] The curing catalyst for stiffening a high polymer formation ingredient can be made to contain in the body molding material of an anisotropic conductive sheet. As such a curing catalyst, organic peroxide, a fatty-acid azo compound, a hydrosilylation catalyst, etc. can be used. As an example of the organic peroxide used as a curing catalyst, a benzoyl peroxide, peroxidation BISUJI cyclo benzoyl, peroxidation JIKUMIRU, peroxidation JITA challis butyl, etc. are mentioned. Azobisisobutyronitril etc. is mentioned as an example of the fatty-acid azo compound used as a curing catalyst. Although it can be used as a catalyst of a hydrosilylation reaction, as an example, well-known things, such as complex of the complex of the complex of chloroplatinic acid and its salt, platinum-partial saturation radical content siloxane complex, the complex of a vinyl siloxane and platinum, platinum, and 1 and 3-divinyl tetramethyl disiloxane, the Tori ORGANO phosphine or phosphite, and platinum, an acetyl acetate platinum chelate, and annular diene and platinum, are mentioned. Although the amount of the curing catalyst used is suitably chosen in consideration of the class of high polymer formation ingredient, the class of curing catalyst, and other hardening processing conditions, it is usually 3 - 15 weight section to the high polymer formation ingredient 100 weight section.
[0046] Moreover, inorganic fillers, such as the usual silica powder, colloidal silica, an aerogel silica, and an alumina, can be made to contain in the body molding material of an anisotropic conductive sheet if needed. By making such an inorganic filler contain, the thixotropy of the body molding material of a different direction conductivity sheet concerned is secured, the viscosity becomes high, and moreover, while the distributed stability of a conductive particle improves, the reinforcement of the body 10 of an anisotropic conductive sheet acquired will become high. Although it is not limited, since it becomes impossible to fully attain the orientation of the conductive magnetic-substance particle by the magnetic field when especially the amount of such inorganic filler used is used so much, it is not desirable. Moreover, as for the viscosity of the body molding material of an anisotropic conductive sheet, in the temperature of 25 degrees C, it is desirable that it is within the limits of 100000 - 1 millioncp.
[0047] Although it can also carry out in the condition [having made the parallel magnetic field act freely], hardening processing of the body molding material layer of an anisotropic conductive sheet can also be performed after stopping an operation of an parallel magnetic field. The reinforcement of the parallel magnetic field which acts on the body material formation ingredient layer of an anisotropic conductive sheet has the desirable magnitude which becomes 200-10000 gauss on an average. Moreover, as a means on which an parallel magnetic field is made to act, a permanent magnet can also be used instead of an electromagnet. As such a permanent magnet, it is the point that the reinforcement of the parallel magnetic field of the above-mentioned range is obtained, and what consists of an Alnico alloy (Fe-aluminum-nickel-Co system alloy), a ferrite, etc. is desirable. Thus, since orientation of the track formation section 11 obtained is carried out so that a conductive particle may be located in a line in the thickness direction of the body 10 of an anisotropic conductive sheet, good conductivity is acquired even if the rate of a conductive particle is small.
[0048] Although the approach of hardening processing of the body molding material layer of an anisotropic conductive sheet is suitably selected by the class of ingredient used, it is usually performed by heat-treatment. What is necessary is just to form a heater in an electromagnet, when heating performs hardening processing of the body molding material layer of an anisotropic conductive sheet. Whenever [concrete stoving temperature], and heating time are suitably selected in consideration of the time amount which migration of classes, such as a charge of high polymer material which constitutes the body molding material layer of an anisotropic conductive sheet, and a conductive magnetic-substance particle takes.
[0049] Arrangement of the contact member to the current carrying part of an anisotropic conductive sheet can be performed, for example by the following approaches.
As shown in body of [implementation gestalt 1 of contact formation] anisotropic conductive sheet 10 front face at drawing 3 , two or more contact members 30 are connected by the part 32 for connection,

and become, for example, it is arranged at the condition that the sheet-like contact formation ingredient 31 piled [the whole which consists of an alloy of copper and nickel] up.
[0050] The contact formation ingredient 31 is in the condition which carried out alignment to the body 10 of an anisotropic conductive sheet so that each of the contact member 30 in the contact formation ingredient 31 might be located on the track formation section 11. For example, the tabular sticking-by-pressure fixture 43 is used into a 100-200-degree C heating ambient atmosphere. Or the tabular sticking-by-pressure fixture 43 heated at 100-200 degrees C is used, and it is a maximum of 20kg/cm2 to the front face of a contact member 30. By applying the press pressure of extent Thermocompression bonding of the contact member 30 is carried out to the track formation section 11 of its that, and thereby, as shown in drawing 6 , the complex 40 which fixed by thermocompression bonding in one where the lower part of a contact member 30 is buried in each front face of the track formation section 11 concerned is formed.
[0051] Subsequently, by inserting in the contact formation ingredient 31 the cutting fixture 44 which has hollow 44A in the location corresponding to the track formation section 11, as shown in drawing 6 By performing after treatment which separates a part for the part 32 for connection which is a part for non-****** of complex 40, and a frame part 33 from a contact member 30, and removes it The insulation-ized processing between contact members 30 is made, it will be in the condition of each contact member 30 having been separated and having insulated electrically, and, thereby, the anisotropic conductive sheet of a configuration of being shown in drawing 1 will be obtained.
[0052] The insulation-ized processing between contact members 30 can also use the technique of removing the part 32 for connection other than the above-mentioned means using laser, or the technique [-izing / by oxidizing the part 32 for connection / technique / un-conducting current].
[0053] <Operation gestalt 2 of contact formation> Drawing 7 is the sectional view for explanation showing the configuration of the important section of the contact member in the gestalt of the 2nd operation concerning the anisotropic conductive sheet of this invention. This anisotropic conductive sheet has the body 10 of an anisotropic conductive sheet which consists of two or more track formation sections 11 extended in the thickness direction, respectively, and the insulating section 12 which insulates these track formation sections 11 mutually. Each of the track formation section 11 in this body 10 of an anisotropic conductive sheet is constituted by the conductive ingredient which has elasticity, and is arranged according to the pattern corresponding to the pattern of the electrode for connection along the direction of a field of the body 10 of an anisotropic conductive sheet concerned. And in the front face of the track formation section 11, the contact member 30 by which thermocompression bonding was carried out is formed in one.
[0054] In the gestalt of this 2nd operation, each of the track formation section 11 is in the condition which that one front face (the inside of drawing, top face) hid caudad from the front face of the insulating section 12, in addition a front face (the inside of drawing, inferior surface of tongue) is in the condition projected from the front face of the insulating section 12 to the upper part. Moreover, the outer diameter r of each of a contact member 30 is smaller than the outer diameter R of the track formation section 11, and it is in the condition which the amount of surface part projected from the front face of the track formation section 11 concerned while the amount of the whole surface flank is moreover in the condition embedded in the track formation section 11 in the body 10 of an anisotropic conductive sheet. It is the same as that of the anisotropic conductive sheet which the concrete configurations of the body 10 of an anisotropic conductive sheet and a contact member 30 require for the gestalt of the 1st operation of the above-mentioned except for the above point.
[0055] The whole surface of the track formation section 11 can form the body 10 of an anisotropic conductive sheet located on the same flat surface as the top face of the insulating section 12, and the above-mentioned anisotropic conductive sheet can manufacture it like the manufacture approach of the anisotropic conductive sheet concerning the gestalt of the 1st operation of the above-mentioned.
[0056] As mentioned above, although the gestalt of operation concerning this invention was explained, in this invention, it is not limited to the gestalt of the above-mentioned operation, but the following various modification can be added. In this invention, if it is in the contact member 30 and the track

formation section 11, and the insulating condition that each contact member 30 adjoins as shown in drawing 8 , you may be in the condition to which a part of part 32 for connection of the contact formation ingredient 31 remained on the front face of the track formation section 11 in the body 10 of an anisotropic conductive sheet. Moreover, in this invention, if each contact member 30 is in an adjoining contact member 30 and the adjoining track formation section 11, and an insulating condition as shown in drawing 9 , as shown in drawing 10 , the outer diameter r may be still larger [the outer diameter r may be the same as the outer diameter R of the track formation section 11, and] than the outer diameter R of the track formation section 11. According to such an anisotropic conductive sheet, in order that the track formation section 11 may not contact the electrode for connection directly, the front face of the electrode for connection is not polluted by the low molecular weight constituent contained in the elastic high polymer which constitutes the track formation section.

[0057] Furthermore, in this invention, as shown in drawing 11 , you may be in the condition that a contact member 30 is embedded in the track formation section 11, and the front face serves as the same plane as the front face of the track formation section 11. In addition, the configuration is not restricted, and contact members 30 may be the shape of a corner guard, ellipse tabular, etc., for example, may have a part for a slitting part or a slot etc.

[0058] In this invention, what has hollow 11A of the magnitude which suits a contact member 30 can also be used for the front face of the track formation section 11 as shown in drawing 12 and drawing 13 which were formed of the proper body molding die of an anisotropic conductive sheet as a body 10 of an anisotropic conductive sheet used for the manufacture approach of an anisotropic conductive sheet. According to using such a body 10 of an anisotropic conductive sheet, the alignment of the contact formation ingredient 31 needed in case thermocompression bonding is performed becomes certain and easy. Here, as for the dimension of formed hollow 11A, it may be desirable that the bore is equivalent to the outer diameter r of a contact member 30, the depth may be smaller than the thickness of a contact member 30, or you may be a thing more than the thickness of a contact member 30.

[0059] the array pattern of the track formation section [in / as a contact formation ingredient 31 used for the manufacture approach of an anisotropic conductive sheet in this invention / the body 10 of an anisotropic conductive sheet] 11 -- an opposite -- the contact formation ingredient 31 which the part 32 for connection which two or more contact members 30 arranged according to the pattern of a palm become from an insulating ingredient comes to connect with one can be used. In this case, the insulation-ized processing between the contact members 30 performed by after treatment to the part 32 for connection becomes unnecessary. As this insulating ingredient, the sheet of various kinds of macromolecules, such as an elastomer and resin, a film or fiber, textile fabrics, etc. can be used.

[0060] The contact member of an anisotropic conductive sheet can be manufactured by approach (b) or approach (b) of the following.

Approach (b): In this approach (b), first, as shown in drawing 14 , prepare the easy-releasability support plates 140, such as stainless steel which has the smooth whole surface 41, and form electrical conducting material layer 30A which consists of a metal in order to form the electrical conducting material 30 for contacts in the whole surface 41 of this easy-releasability support plate 140. Subsequently, the resist layer 45 which has the hole 46 formed of the technique of photolithography according to the pattern corresponding to the arrangement pattern of the track formation section 11 made into the purpose on electrical conducting material layer 30A supported on the whole surface 41 of the easy-releasability support plate 140 is formed. And by being filled up with the fluid conductive glue line formation ingredient with which it comes to distribute conductive powder into a hardenability resin ingredient, and performing hardening processing of the conductive glue line formation ingredient concerned in the hole 46 of the resist layer 45, as shown in drawing 16 , the conductive glue line 20 is formed in the hole 46 of the resist layer 45.

[0061] As an approach of forming electrical conducting material layer 30A which becomes above from a metal at the whole surface 41 of the easy-releasability support plate 140, the sputtering method, vacuum deposition, other plating, etc. can be used. As an approach filled up with a conductive glue line formation ingredient in the hole 46 of the resist layer 45, print processes, such as screen-stencil, porous

print processes, etc. can be used.
[0062] Subsequently, by applying the sheet base material formation ingredient with which it comes to distribute a conductive magnetic-substance particle into the charge of high polymer material which is hardened and serves as an elastic high polymer, as shown in drawing 17 , sheet base material formation ingredient layer 10A is formed in the top face of the resist layer 45 and the conductive glue line 20 on the top face of the resist layer 45 and the conductive glue line 20. Moreover, as for the viscosity of a sheet base material formation ingredient, in the temperature of 25 degrees C, it is desirable that it is within the limits of 100000 - 1 millioncp.
[0063] Subsequently, as shown in drawing 18 , while arranging one magnetic pole plate 50 on the top face of sheet base material formation ingredient layer 10A, the magnetic pole plate 55 of another side is arranged on the inferior surface of tongue of the easy-releasability support plate 140, and the electromagnets 51 and 56 of a pair are further arranged on the top face of one magnetic pole plate 50, and the inferior surface of tongue of the magnetic pole plate 55 of another side. the arrangement pattern of the track formation section 11 which makes one magnetic pole plate 50 the purpose here -- an opposite -- a ferromagnetic part M is formed according to a **** pattern, and the non-magnetic-material part N is formed in parts other than this ferromagnetic part M, and it is arranged so that the ferromagnetic part M concerned may be located above the conductive glue line 20. Moreover, a ferromagnetic part M is formed according to the same pattern as the arrangement pattern of the track formation section 11 made into the purpose, the non-magnetic-material part N is formed in parts other than this ferromagnetic part M, and the magnetic pole plate 55 of another side is arranged so that the ferromagnetic part M concerned may be located under the conductive glue line 20.
[0064] And an parallel magnetic field acts in the direction which goes to the ferromagnetic part M of the magnetic pole plate 55 of another side corresponding to this from the ferromagnetic part M of one magnetic pole plate 50 by operating electromagnets 51 and 56. Consequently, in sheet base material formation ingredient layer 10A, the conductive magnetic-substance particles currently distributed in the sheet base material formation ingredient layer 10A concerned gather into the part located between the ferromagnetic part M of one magnetic pole plate 50, and the ferromagnetic part M of the magnetic pole plate 55 of another side corresponding to this, and carry out orientation in the thickness direction of the sheet base material formation ingredient layer 10A concerned still more preferably. In this condition, sheet base material formation ingredient layer 10A and by carrying out hardening processing The track formation section 11 with which the conductive magnetic-substance particle arranged between the ferromagnetic part M of one magnetic pole plate 50 and the ferromagnetic part M of the magnetic pole plate 55 of another side corresponding to this was densely filled up as shown in drawing 19 , there is completely a conductive magnetic-substance particle -- it is -- the sheet base material 10 which consists of the insulating section 12 which hardly exists is formed.
[0065] Although hardening processing of sheet base material formation ingredient layer 10A can also be performed in the condition [having made the parallel magnetic field act freely] above, it can also carry out, after stopping an operation of an parallel magnetic field. The reinforcement of the parallel magnetic field which acts on sheet base material formation ingredient layer 10A has the desirable magnitude which becomes 200-10000 gauss on an average. Moreover, as a means on which an parallel magnetic field is made to act, a permanent magnet can also be used instead of an electromagnet.
[0066] Although hardening processing of sheet base material formation ingredient layer 10A is suitably selected with the ingredient used, it is usually performed by heat-treatment. What is necessary is just to form a heater in electromagnets 51 and 56, when heating performs hardening processing of sheet base material formation ingredient layer 10A. Whenever [concrete stoving temperature], and heating time are suitably selected in consideration of the time amount which migration of classes, such as a charge of high polymer material which constitutes sheet base material formation ingredient layer 10A, and a conductive magnetic-substance particle takes.
[0067] Thus, the easy-releasability support plate 140 with which the sheet base material 10 was formed is taken out from between one magnetic pole plate 50 and the magnetic pole plates 55 of another side, and the easy-releasability support plate 40 is made to exfoliate from electrical conducting material layer

30A further. And by performing photolithography and etching processing and removing that part to this electrical conducting material layer 30A, as shown in drawing 20 , the anisotropic conductive sheet of a configuration of being shown in drawing 14 is obtained by removing the resist layer 45 which the electrical conducting material 30 for contacts by the remainder of electrical conducting material layer 30A which consists of a metal sheet or a metal membrane, for example was formed on the conductive glue line 20, and was further formed on the sheet base material 10. According to such an approach, while the adhesive conductive high glue line 20 is obtained certainly, the sheet base material 10 can be formed easily.

[0068] Approach (b) : In this approach (b), the sheet base material 10 beforehand produced by the proper approach is prepared. On this sheet base material 10, the resist layer 45 which has the hole 46 to which the top face of the track formation section 11 is exposed is formed. After being filled up with the above-mentioned conductive glue line formation ingredient in the hole 46 of this resist layer 45, as shown in drawing 21 , the conductive glue line 20 is formed in the hole 46 of the resist layer 45 by performing hardening processing of the conductive glue line formation ingredient concerned. Print processes, such as screen-stencil, etc. can be used as an approach filled up with a conductive glue line formation ingredient in the hole 46 of the resist layer 45.

[0069] Subsequently, as shown in drawing 22 , form electrical conducting material layer 30A which consists of a metal in order to form the electrical conducting material 30 for contacts in the top face of the resist layer 45 and the conductive glue line 20, and this electrical conducting material layer 30A is received. By performing photolithography and etching processing and removing the part By removing the resist layer 45 which the electrical conducting material 30 for contacts by the remainder of electrical conducting material layer 30A which consists of a metal sheet or a metal membrane, for example was formed on the conductive glue line 20, and was further formed on the sheet base material 10, as shown in drawing 23 The anisotropic conductive sheet of a configuration of being shown in drawing 14 is obtained. As an approach of forming electrical conducting material layer 30A in the top face of the resist layer 45 and the conductive glue line 20, the sputtering method, vacuum deposition, other plating, etc. can be used.

[0070] <Gestalt of the 2nd operation> Drawing 24 is the sectional view for explanation showing the configuration of the important section of the connection member in the gestalt of the 2nd operation concerning the anisotropic conductive sheet of this invention. In the gestalt of this 2nd operation, each of the track formation section 11 has thickness smaller than the thickness of the insulating section 12, and the hollow 15 is formed on the track formation section 11 concerned by being arranged so that that top face may be caudad located from the top face of the insulating section 12. And by holding the conductive glue line 20 in the hollow 15 formed on the track formation section 11, the conductive glue line 20 concerned is arranged so that the top face may be located on the same flat surface as the top face of the insulating section 12, and thereby, it is made into the condition that the electrical conducting material 30 for contacts projected from the front face of the insulating section 12 in the sheet base material 10. Each concrete configuration of the sheet base material 10, the conductive glue line 20, and the electrical conducting material 30 for contacts is the same as that of the anisotropic conductive sheet applied in the gestalt of the 1st operation of the above-mentioned above.

[0071] The above-mentioned anisotropic conductive sheet can be manufactured by the following approaches. First, electrical conducting material layer 30A which consists of a metal in order to form the electrical conducting material 30 for contacts in the whole surface 41 of the easy-releasability support plate 140 is formed like approach (b) in the gestalt of the 1st operation of the above-mentioned. Subsequently, on electrical conducting material layer 30A supported on the whole surface 41 of this easy-releasability support plate 140 By applying the fluid conductive glue line formation ingredient with which it comes to distribute conductive powder according to the pattern corresponding to the arrangement pattern of the track formation section 11 made into the purpose into a hardenability resin ingredient, and performing hardening processing of the conductive glue line formation ingredient concerned As shown in drawing 25 , the conductive glue line 20 is formed in the top face of electrical conducting material layer 30A. And the sheet base material formation ingredient with which it comes to

distribute a conductive magnetic-substance particle is applied into the charge of high polymer material which is hardened by the top face of the conductive glue line 20 and electrical conducting material layer 30A, and serves as an elastic high polymer. While making an parallel magnetic field act like approach (b) in the gestalt of the 1st operation hereafter, hardening processing of the sheet base material formation ingredient layer 10A concerned is performed, the easy-releasability support plate 140 with which the sheet base material 10 was formed is taken out from between one magnetic pole plate 50 and the magnetic pole plates 55 of another side, and the easy-releasability support plate 140 is made to exfoliate from electrical conducting material layer 30A further. And the anisotropic conductive sheet of a configuration of the electrical conducting material 30 for contacts which consists of a metal sheet or a metal membrane being formed on the conductive glue line 20, with being shown in drawing 14 is obtained by performing photolithography and etching processing and removing that part to this electrical conducting material layer 30A.

[0072] <Gestalt of the 3rd operation> Drawing 26 is the sectional view for explanation showing the configuration of the important section in the gestalt of the 3rd operation concerning the anisotropic conductive sheet of this invention. In the gestalt of this 3rd operation, the conductive glue line 20 and the electrical conducting material 30 for contacts are made into the condition of having projected from the front face of the insulating section 12 in the sheet base material 10. Moreover, the electrical conducting material 30 for contacts is formed so that the top face and side face of the conductive glue line 20 may be covered.

[0073] The above-mentioned anisotropic conductive sheet can be manufactured by the following approaches. First, like approach (b) in the gestalt of the 1st operation of the above-mentioned, as shown in drawing 27 , the resist layer 45 which has the hole 46 formed in the whole surface 41 of this easy-releasability support plate 140 of the technique of photolithography according to the pattern corresponding to the arrangement pattern of the track formation section 11 made into the purpose is formed. Subsequently, electrical conducting material layer 30A which consists of a metal in order to form the electrical conducting material 30 for contacts on this resist layer 45 and the easy-releasability support plate 40 is formed. Then, by being filled up with the fluid conductive glue line formation ingredient with which it comes to distribute conductive powder into a hardenability resin ingredient, and performing hardening processing of the conductive glue line formation ingredient concerned in the hole 46 of the resist layer 45 As shown in drawing 28 , the conductive glue line 20 is formed in the hole 46 of the resist layer 45. And the sheet base material formation ingredient with which it comes to distribute a conductive magnetic-substance particle is applied into the charge of high polymer material which is hardened by the top face of the conductive glue line 20 and electrical conducting material layer 30A, and serves as an elastic high polymer. Hereafter, like approach (b) in the gestalt of the 1st operation of the above-mentioned, while making an parallel magnetic field act, hardening processing of the sheet base material formation ingredient layer 10A concerned is performed.

[0074] Thus, the easy-releasability support plate 140 with which the sheet base material 10 was formed is taken out from between one magnetic pole plate 50 and the magnetic pole plates 55 of another side, and the easy-releasability support plate 140 is made to exfoliate from electrical conducting material layer 30A further. And the anisotropic conductive sheet of a configuration of the electrical conducting material 30 for contacts by the remainder of electrical conducting material layer 30A which consists of a metal sheet or a metal membrane, for example being formed on the conductive glue line 20, with being shown in drawing 26 is obtained by removing the resist layer 45 by exposing the whole surface of electrical conducting material layer 30A, performing photolithography and etching processing to this electrical conducting material layer 30A, and removing that part.

[0075] Next, an electric discharge layer is described.

<<electric discharge layer>> As an ingredient which constitutes an electric discharge layer, what has conductivity in itself (henceforth the "self-conductivity matter"), the thing (henceforth the "moisture absorption conductivity matter") by which conductivity is discovered by absorbing moisture can be used. The matter in which conductivity is generally shown by metallic bond as self-conductivity matter, the thing to which migration of a charge takes place by migration of a surplus electron, the thing to

which migration of a charge takes place by migration of a hole, and ion generate, and it can have pi bonding along with the thing and the principal chain with which the ion carries a charge, and it can choose from the matter in which conductivity is shown by the interaction, the matter which causes migration of a charge by the interaction of the radical in a side chain and it can use. Specifically Platinum, gold, silver, copper, nickel, cobalt, iron, aluminum, Manganese, zinc, tin, lead, an indium, molybdenum, niobium, a tantalum, Metal particles containing chromium etc.; Whisker; germanium [, such as conductive-metallic-oxide; potassium titanate], such as diacid-ized copper, a zinc oxide, and tin oxide, Semi-conductive matter, such as silicon, indium phosphide, and zinc sulfide; Carbon black, Matter of carbon systems, such as graphite; The matter; aliphatic series sulfonate which generates cations, such as quarternary ammonium salt and an amine system compound, Fatty alcohol sulfate, a higher-alcohol ethyleneoxide addition sulfate salt, Matter which generates both cations, such as a matter; betaine which generates anions, such as a higher-alcohol phosphoric ester salt and a higher-alcohol ethyleneoxide addition phosphoric ester salt, and an anion; A polyacethylene system polymer, Conductive polymer matter, such as an acrylic polymer, a polyphenylene system polymer, a heterocycle polymer, ladder polymer, a network polymer, and an ionicity polymer, etc. can be used. The matter which generates ion above may be named generically as a surfactant. Moreover, in polymers, such as a polyacethylene system polymer, an acrylic polymer, a polyphenylene system polymer, ladder polymer, and a network polymer, it is also possible by doping a metal ion etc. to control conductivity. As moisture absorption conductivity matter, generally, it is desirable that it is the hygroscopic large matter, and it is desirable that it is the matter with a hydroxyl group, an ester group, etc. which is a polar large radical. Specifically, alcoholic system surfactants, such as polymeric materials, such as silicon compound; conductivity urethane, such as a KURORU polysiloxane, alkoxysilane, alkoxy polysilane, and an alkoxy polysiloxane, polyvinyl alcohol, or its copolymer, higher-alcohol ethyleneoxide, polyethylene glycol fatty acid ester, and polyhydric-alcohol fatty acid ester, polysaccharide, etc. can be used.

[0076] Such conductive matter can constitute an electric discharge layer using a proper binder, when forming a layer by itself will adjust the conductivity of the electric discharge layer using a difficult thing which should be case [a layer] or formed although an electric discharge layer can be constituted independently if a layer can be formed by itself. What dissolved a thermoplastics ingredient, a hardenability resin ingredient, paper, the binder, and the resin ingredient in the solvent, and gave the fluidity as such a binder can be used, and what can be hardened with a radiation, heat, ion, an acid, etc. can be used as a hardenability resin ingredient.

[0077] As for an electric discharge layer, it is desirable that the surface specific resistance is below 1x1012ohms / **, and it is especially desirable that they are 1x105 to 1x1010ohms / **. the case where surface specific resistance exceeds 1x1012ohms / ** -- electrification of the front face of a sheet -- enough -- or preventing or controlling may become difficult On the other hand, when and for example, the electric discharge layer is formed over the whole front face of a sheet object, the necessary insulation in the direction of a field may not be acquired. [surface specific resistance]

[0078] Moreover, it is desirable that the electrical conductivity (inverse number of volume resistivity) is 1x10 to 7 ohm to 1 m to more than [1], and an electric discharge layer is 1x10-7 to 1x104 especially. It is desirable that it is omega-1m-1. the case where electrical conductivity is 1x10 to 7 ohm to 1 m to less than [1] -- electrification of the front face of a sheet -- enough -- or preventing or controlling may become difficult On the other hand, when electrical conductivity is excessive and for example, the electric discharge layer is formed over the whole front face of a sheet object, the necessary insulation in the direction of a field may not be acquired.

[0079] As an approach of forming an electric discharge layer on a sheet object, it can choose suitably according to the ingredient which constitutes the electric discharge layer concerned, and, specifically, the approach of following (1) - (4) can be used.

(1) How to prepare the fluid constituent for electric discharge stratification which comes to contain the conductive matter (self-conductivity matter and/or moisture absorption conductivity matter), to apply this constituent for electric discharge stratification to a sheet object, form a paint film, and carry out fixing processing of this paint film after that.

(2) How to manufacture the film for electric discharge layers which should serve as an electric discharge layer, and to paste up this film for electric discharge layers on a sheet object.
(3) How to carry out plating processing of metals, such as electrolytic plating, electroless deposition, sputtering, and vacuum evaporationo, to a sheet object.
(4) How to form in the shaping side of metal mold an electric discharge layer and the layer which should become, and to manufacture a sheet object in the metal mold concerned.
[0080] In the approach of the above (1), in order to give a fluidity to the constituent for electric discharge stratification, or in order to adjust the fluidity of the constituent for electric discharge stratification, a proper solvent can be used.
[0081] As an approach of applying the constituent for electric discharge stratification to the front face of a sheet object, a spray method, an approach with the brush, the approach by immersion, the approach of covering as LB film, a roll coating method, the approach of applying with a blade (squeegee), etc. can be used.
[0082] Fixing processing of the paint film which consists of a constituent for electric discharge stratification is chosen according to the class of component which constitutes the constituent for electric discharge stratification concerned. When using the thing which the thing which the conductive matter as a constituent for electric discharge stratification which can specifically form a layer comes to contain in a solvent or the conductive matter, and a binder come to contain in a solvent, an electric discharge layer is formed by being established by carrying out desiccation processing of the paint film of the constituent for electric discharge stratification concerned. moreover, the thing done for the hardening processing of the paint film of the constituent for electric layer formation concerned when using the thing which comes to contain the conductive matter and the hardenability ingredient used as a binder as a constituent for electric discharge stratification -- or the thing done for hardening processing after desiccation processing is carried out -- an electric discharge layer is formed by being established. As above constituents for electric discharge stratification, what is generally marketed as a "antistatic agent" or a "conductive paint" can be used.
[0083] moreover, the field which does not form the electric discharge layer in the front face of the sheet object concerned in the approach of the above (1) in forming an electric discharge layer in some [in the front face of a sheet object] fields -- a resist -- or a tape -- ** -- after it was alike, forming a mask more and forming an electric discharge layer using the constituent for electric discharge stratification, the approach of removing the mask concerned is employable.
[0084] In the approach of the above (2), the means by thermocompression bonding and the means using proper adhesives are employable as a means to paste up the film for electric discharge layers on a sheet object. Moreover, as a film for electric discharge layers, what is generally marketed as "an antistatic film (sheet)", and a metallic foil can be used. In the approach of the above (3), in forming an electric discharge layer in some [in the front face of a sheet object] fields the field which does not form the electric discharge layer in the front face of the sheet object concerned -- a resist -- or a tape -- **, after it was alike and forming a mask more After forming an electric discharge layer by plating processing, the approach of forming a metal layer in the front face of a sheet object, performing photolithography and etching processing to this metal layer, and removing that part by the approach and plating processing in which the mask concerned is removed can be used. In the approach of the above (4), the approach of above-mentioned (1) - (3) is applicable as an approach of forming in the shaping side of metal mold an electric discharge layer and the layer which should become.
[0085] Structure>> of the body of <<anisotropic conductive sheet If the anisotropic conductive sheet of this invention has the above sheet objects and an electric discharge layer, especially the concrete structure is not limited and can adopt the thing of various structures. Hereafter, the concrete example of structure of the electric discharge layer of the anisotropic conductive sheet of this invention is explained.

[0086] [Example 1 of structure] The sectional view for explanation of the anisotropic conductive sheet concerning the example 1 of structure is shown in drawing 29 . This anisotropic conductive sheet 10 is constituted by sheet object 10A and the electric discharge layer 130 prepared so that fields other than

that circumference might be covered on the whole surface of this sheet object 10A.
[0087] In such an anisotropic conductive sheet 10, since current-carrying-part 11 adjoining comrades are in the condition that the electric discharge layer 130 connected, it is 1x107 to 1x109ohms / ** that the surface specific resistance of the electric discharge layer 130 is 1x105 to 1x1011ohms / ** desirable still more preferably. Surface specific resistance is 1x105. When it is under omega/**, the necessary insulation between adjoining current carrying parts may not be acquired. the case where surface specific resistance, on the other hand, exceeds 1x1011ohms / ** -- electrification of the front face of a sheet -- enough -- or preventing or controlling may become difficult Moreover, when the thickness of the electric discharge layer 30 is 0.1mm by the same reason, as for the electrical conductivity of the electric discharge layer 130, it is desirable that it is 1x10-1-1x10-5ohm-1m-1.
[0088] [Example 2 of structure] The sectional view for explanation of the anisotropic conductive sheet concerning the example 2 of structure is shown in drawing 30 . This anisotropic conductive sheet 10 has sheet object 10A which a conductive particle becomes from two or more current carrying parts 11 with which it filled up densely, and which are extended in the thickness direction, respectively, and the insulating section 12 which insulates these current carrying parts 11 mutually, the high density current-carrying-part fields 21A, 21B, and 21C where the current carrying part 11 has been arranged by the high consistency with the small pitch are formed in the sheet object 10A concerned, and the contact member is arranged at that crowning. And the electric discharge layer 130 in which opening 131 was formed is formed in the whole surface of this sheet object 10A, and it considers as the condition that the high density current-carrying-part fields 21A, 21B, and 21C in sheet object 10A were exposed with the opening 131 of this electric discharge layer 130.
[0089] In such an anisotropic conductive sheet 10, it is 0.5-3mm that the clearance d of the periphery of the current carrying part 11 in the whole surface of sheet object 10A and the opening edge of the electric discharge layer 130 is 10mm or less especially preferably 5mm or less desirable still more preferably. When this clearance d exceeds 10mm, the field between the periphery of the current carrying part 11 in the whole surface of sheet object 10A and the opening edge of the electric discharge layer 130 becomes easy to be charged. On the other hand, when too little [this clearance], depending on the quality of the material and thickness of the electric discharge layer 130, the necessary insulation in the direction of a field may not be acquired. Moreover, as for especially the clearance D between the adjoining current carrying parts [in / by the same reason / the high density current-carrying-part fields 21A, 21B, and 21C of the sheet object 20] 21, it is desirable that it is 0.1-1mm 3mm or less.
[0090] It is desirable still more desirable that it is 100 micrometers or less, and the thickness of the electric discharge layer 130 is 50 micrometers or less. When this thickness exceeds 100 micrometers, it may become difficult for the electric discharge layer 130 concerned to serve as a failure, and for the electrical installation of the inspected electrode of the circuit apparatus which is a subject of examination, and the current carrying part 11 of sheet object 10A to attain certainly.
[0091] [Example 3 of structure] The sectional view for explanation of the anisotropic conductive sheet concerning the example 3 of structure is shown in drawing 31 . Two or more current carrying parts 11 to which it fills up with a conductive particle densely, and a contact member is arranged at that crowning, and this anisotropic conductive sheet 10 is extended in the thickness direction, respectively, It has sheet object 10A which consists of the insulating section 12 which insulates these current carrying parts 11 mutually. On the whole surface of this sheet object 10A The electric discharge layer 130 in which opening 131 was formed according to the pattern corresponding to the pattern of the current carrying part 11 concerned is formed, and it considers as the condition that each of the current carrying part 11 of sheet object 10A was exposed with each of the opening 131 of this electric discharge layer 130.
[0092] In such an anisotropic conductive sheet 10, it is desirable like the anisotropic conductive sheet concerning the above-mentioned example 2 of structure that the clearance d of the periphery of the current carrying part 11 in the whole surface of sheet object 10A and the opening edge of the electric discharge layer 130 is 0.5-2mm especially 5mm or less. Moreover, when forming the electric discharge layer 130 between the adjoining current carrying parts 11, it is desirable still more desirable that it is 2mm or more, and the clearance D between the adjoining current carrying parts 11 in sheet object 10A is

5mm or more especially preferably 3mm or more. When this clearance D is less than 2mm, it may become difficult to form the electric discharge layer 30 in the field between the adjoining current carrying parts 11.

[0093] [Example 4 of structure] The sectional view for explanation of the anisotropic conductive sheet concerning the example 4 of structure is shown in drawing 32 . It fills up with a conductive particle densely, a contact member is arranged at that crowning, this anisotropic conductive sheet 10 has sheet object 10A which consists of two or more current carrying parts 11 extended in the thickness direction, respectively, and the insulating section 12 which insulates these current carrying parts 11 mutually, and the high density current-carrying-part fields 21A, 21B, and 21C where the current carrying part 11 has been arranged by the high consistency with the small pitch are formed in the sheet object 10A concerned. And the hollow 23 is formed in the high density current-carrying-part fields 21A and 21B and fields other than 11C at the whole surface of this sheet object 10A, and the electric discharge layer 130 is formed in this hollow 23.

[0094] [Example 5 of structure] The sectional view for explanation of the anisotropic conductive sheet concerning the example 5 of structure is shown in drawing 33 , and the top view of the anisotropic conductive sheet concerned is shown in drawing 34 . It fills up with a conductive particle densely, a contact member is arranged at that crowning, this anisotropic conductive sheet 10 has sheet object 10A which consists of two or more current carrying parts 11 extended in the thickness direction, respectively, and the insulating section 12 which insulates these current carrying parts 11 mutually, and the high density current-carrying-part fields 21A, 21B, and 21C where the current carrying part 11 has been arranged by the high consistency with the small pitch are formed in the sheet object 10A concerned. Moreover, in high density current-carrying-part field 21B, as shown in drawing 34 , the current carrying part 11 is arranged in the shape of [rectangular] a frame. And the high conductivity electric discharge layer 35 in which opening 36 was formed is formed at the whole surface of this sheet object 10A on the high density current-carrying-part fields 21A and 21B and 21C, and on high density current-carrying-part field 21B by which the current carrying part 11 has been arranged in the shape of [rectangular] a frame, the low conductivity electric discharge layer 37 is formed so that the opening 36 of the high conductivity electric discharge layer 35 may be plugged up.

[0095] In the above-mentioned anisotropic conductive sheet 10 the high conductivity electric discharge layer 35 for example, when the thickness is 0.1mm Surface specific resistance is 1x108. It is desirable that electrical conductivity is 1x10 to 4 ohm to 1 m to more than [1] at below omega/**, and surface specific resistance is 1x105 to 1x107 especially. It is desirable that electrical conductivity is 1x10-1-1x10-3ohm-1m-1 at omega/**. moreover, when the thickness is 0.1mm, for example, the low conductivity electric discharge layer 37 It is desirable that surface specific resistance is [electrical conductivity] 1x10-4 to 1x10 to 8 ohm to 1 m to more than [1] in 1x108 to 1x1012ohms / **. Surface specific resistance especially by 2.5x109 to 2.5x1011ohms / ** It is desirable that electrical conductivity is 1x10-5-1x10-7ohm-1m-1.

[0096] According to such an anisotropic conductive sheet 10, since the high conductivity electric discharge layer 35 is formed in the high density current-carrying-part fields 21A and 21B in the whole surface of sheet object 10A, and fields other than 21C, electrification can be prevented or controlled at high effectiveness. And it sets to the field (this is hereafter called "independent field".) surrounded by high density current-carrying-part field 21B by which the current carrying part 11 has been arranged in the shape of a frame. Since the high conductivity electric discharge layer 35 formed on the independent field concerned is connected to the high conductivity electric discharge layer 35 formed in fields other than an independent field through the low conductivity electric discharge layer 37 formed on the high density current-carrying-part field 21B concerned, electrification can be prevented or controlled certainly.

[0097] [Example 6 of structure] The sectional view for explanation of the anisotropic conductive sheet concerning the example 6 of structure is shown in drawing 35 . It fills up with a conductive particle densely, a contact member is arranged at that crowning, this anisotropic conductive sheet 10 has sheet object 10A which consists of two or more current carrying parts 11 extended in the thickness direction,

respectively, and the insulating section 12 which insulates these current carrying parts 11 mutually, and the high density current-carrying-part fields 21A, 21B, and 21C where the current carrying part 11 has been arranged by the high consistency with the small pitch are formed in the sheet object 10A concerned. Moreover, in this example, each of the current carrying part 11 of the sheet object 10 is formed in the condition of having projected from both sides of the insulating section 12. And the electric discharge layer 130 in which opening 131 was formed is formed in the whole surface of this sheet object 10A, and it considers as the condition that the high density current-carrying-part fields 21A, 21B, and 21C in sheet object 10A were exposed with the opening 131 of this electric discharge layer 130. In such an anisotropic conductive sheet 10, as for the protrusion height of the current carrying part 11 of sheet object 10A, it is desirable that it is larger than the thickness of the electric discharge layer 130, and it is especially desirable that it is 2 to 10 times the thickness of the electric discharge layer 130.

[0098] In such an anisotropic conductive sheet 10, it is desirable still more desirable that they are 1x106 to 1x1011ohms / **, and the surface specific resistance of the electric discharge layer 130 is 1x108 to 1x1010ohms / **. Surface specific resistance is 1x106. When it is under omega/**, the necessary insulation in the direction of a field may not be acquired. the case where surface specific resistance, on the other hand, exceeds 1x1011ohms / ** -- electrification of the front face of a sheet -- enough -- or preventing or controlling may become difficult Moreover, when the thickness of the electric discharge layer 130 is 0.1mm by the same reason, as for the electrical conductivity of the electric discharge layer 130, it is desirable that it is 1x10-4-1x10-6ohm-1m-1.

[0099] [Example 7 of structure] By the aforementioned approach etc., an anisotropic conductive sheet without a contact member as shown in drawing 2 etc. is manufactured. The front face of this anisotropic conductive sheet may be convex, may be a flat surface, or may be a concave. Next, a metal membrane is formed in the whole surface or some of this surface anisotropic conductive sheet by sputtering etc. Copper, nickel, gold, platinum, a rhodium, etc. are mentioned as this metal. although there is especially no limit and it can be formed in proper thickness as thickness of a metal membrane, 0.1-100-micrometer 0.2-10-micrometer 0.3-3 micrometers [0.4-2-micrometer] come out especially still more preferably preferably. The anisotropic conductive sheet with which the metal membrane manufactured as mentioned above was formed can manufacture the anisotropic conductive sheet of this invention by cutting this a part of metal membrane of parts other than a current carrying part, and insulating each current carrying part electrically. In order to cut a part of metal membrane, laser, such as YAG and an excimer, is suitable. moreover, the anisotropic conductive sheet with which the metal membrane manufactured above was formed as an option with the above -- the metal membrane front face -- the layer of a photopolymer (resist) -- forming -- HOTORISO -- the anisotropic conductive sheet of this invention can be manufactured by carrying out opening of this a part of metal membrane of parts other than a current carrying part by law, and etching etc. removing the metal membrane of the part, and insulating each current carrying part electrically.

[0100] Operation>> of <<anisotropic conductive sheet The anisotropic conductive sheet of this invention can be used suitable for the electrical installation and electric inspection of a circuit apparatus. The case where electric inspection of a circuit apparatus is hereafter conducted using the anisotropic conductive sheet 10 concerning the above-mentioned example 2 of structure is explained. The circuit apparatus which is a subject of examination as electric inspection of a circuit apparatus is shown in drawing 36 (It is also hereafter called an "inspected circuit apparatus".) It has the electrode 41 for connection arranged according to a **** pattern on a front face. the inspected electrode 2 of 1 -- an opposite -- The connector plate 60 which has the terminal electrode 42 which was electrically connected to the electrode 41 for connection through wiring section 42A, for example, has been arranged according to the lattice point array whose pitch is 2.54mm, 1.80mm, or 1.27mm at the rear face is prepared. And it is arranged so that the anisotropic conductive sheet 10 may be located on the front face of this connector plate 60 and the current carrying part 11 of that sheet object 10A may be located on the electrode 41 for connection, and it is arranged so that the inspected circuit apparatus 1 may be located on this anisotropic conductive sheet 10 on the current carrying part 11 of sheet object 10A [in / in that inspected electrode 2 / the anisotropic conductive sheet 10 concerned]. Here, the anisotropic conductive sheet 10 is

arranged so that the electric discharge layer 130 may become a circuit apparatus 2 side, and the electric discharge layer 130 concerned is grounded by the proper means.
[0101] And for example, by moving the connector plate 60 in the direction close to the inspected circuit apparatus 1 The anisotropic conductive sheet 10 will be in the condition of having been pressurized with the inspected circuit apparatus 1 and the connector plate 60. With this welding pressure The track extended in that thickness direction is formed in the current carrying part 11 of sheet object 10A in the anisotropic conductive sheet 10, consequently the electrical installation between the inspected electrode 2 of the inspected circuit apparatus 1 and the electrode 41 for connection of the connector plate 60 is attained, and electric inspection necessary in this condition is conducted. And after electric inspection of the inspected circuit apparatus 1 is completed, it is exchanged for inspected circuit apparatus with this another inspected circuit apparatus 1, and electric inspection is suitably conducted by repeating the same actuation as the above to the inspected circuit apparatus concerned. Moreover, since the connection member of right conductivity is arranged at the crowning of a current carrying part, in case the anisotropic conductive sheet of this invention removes an anisotropic conductive sheet from a circuit apparatus etc., it does not have generating of static electricity, either.
[0102] Furthermore, according to the anisotropic conductive sheet 10 of this invention, since the electric discharge layer 130 is formed in the whole surface of sheet object 10A, it can prevent or control that static electricity is arisen and charged on the whole surface of an anisotropic conductive sheet by grounding the electric discharge layer 130 concerned. Therefore, since it becomes unnecessary to interrupt inspection and to do the electric discharge activity of an anisotropic conductive sheet in using the anisotropic conductive sheet of this invention for electric inspection of circuit apparatus, such as a printed circuit board and a semiconductor integrated circuit, electric inspection of a circuit apparatus can be conducted at high time effectiveness.
[0103] it is alike, and is not limited to the gestalt of the above-mentioned operation, and the anisotropic conductive sheet of this invention can add various modification For example, in the above-mentioned examples 1-7 of structure, the electric discharge layer 130 may be formed in both sides of sheet object 10A. Moreover, the laminating of two or more electric discharge layers 130 can be carried out to sheet object 10A, and they can also be prepared in it. Moreover, the anisotropic conductive sheet 10 may be formed in the front face of the connector plate 60 used for electric inspection of a circuit apparatus in one.
[0104]
[Example] Hereafter, although the example of this invention is explained, this invention is not limited to these examples. Moreover, the detail of the sheet object used in the following examples is as follows.
[-- a gestalt --] -- drawing 36 -- being shown -- a gestalt -- conductivity -- a particle -- dense -- being filled up -- having had -- thickness -- a direction -- being extended -- plurality -- a current carrying part -- an insulation -- the section -- mutual -- insulating -- having had -- a condition -- arranging -- having -- becoming -- a thing (maldistribution mold) -- thickness -- 1.2 -- mm -- a current carrying part -- a path -- 0.8 -- mm -- a current carrying part -- a pitch -- 1.5 -- mm -- [-- a base material --] -- addition -- a mold -- silicone rubber -- [-- conductivity -- a particle --] -- mean particle diameter -- 40 -- micrometer -- it is -- nickel -- a particle -- gold -- plating -- having -- becoming -- a thing -- [-- 0105 --] <Example 1> According to the approach of the aforementioned example 7 of structure, whole surface sputtering of the platinum was carried out to the front face of an anisotropic conductive sheet, insulating processing was performed around the contact member by laser, and the anisotropic conductive sheet with which the contact member was prepared in the current carrying part as shown in drawing 14 was manufactured.
[0106] <Example 2> According to the approach of the aforementioned example 7 of structure, whole surface sputtering of the copper was carried out to the front face of an anisotropic conductive sheet, insulating processing was performed around the contact member by laser, and the anisotropic conductive sheet with which the contact member was prepared in the current carrying part as shown in drawing 14 was manufactured.
[0107] <Example 3> According to the approach of the aforementioned example 7 of structure, whole surface sputtering of copper and the gold was carried out to the front face of an anisotropic conductive

sheet, insulating processing was performed around the contact member by laser, and the anisotropic conductive sheet with which the contact member was prepared in the current carrying part as shown in drawing 14 was manufactured.

[0108] <Example 1 of a comparison> Sputtering was not processed and the anisotropic conductive sheet was manufactured according to the approach of an example 1 except not preparing a contact member in a current carrying part.

[0109] [Example 1 of a trial] On the glass fiber reinforcement mold epoxy group plate, each of the anisotropic conductive sheet manufactured in examples 1-3 and the example 1 of a comparison was fixed, after the electric discharge layer had turned to the top, and this has been arranged on the aluminum plate grounded after the anisotropic conductive sheet had turned to the top. Subsequently, to the bottom of the condition of 100 atmospheric temperature, the package circuit board (inspected object) has been arranged on the front face of an anisotropic conductive sheet, the anisotropic conductive sheet was pressurized for 2 seconds by the load of 130kgf, and this actuation was performed 10,000 times in total. And after passing for 50 seconds after the above-mentioned trial is completed, the surface potential of an inspected object and an anisotropic conductive sheet was measured. A test result is shown in Table 1 above.

[0110]

[Table 1]

実施例	帯電量 【V】	
	被検査物	PCR
比較例1	+600	−300
実施例1	+10以下	−10以下
実施例2	+10以下	−10以下
実施例3	+10以下	−10以下

No examples are charged but +10 and -ten or less value are the measurement-on precision impossible field [0111] of ******** a result without a problem. According to the anisotropic conductive sheet concerning examples 1-3, after the trial was completed, each value of the surface potential after progress was small for 50 seconds, and it was checked that it is controlled certainly that static electricity is arisen and charged on a front face so that clearly from the result of Table 1. On the other hand, in the example of a comparison, after the trial was completed, each value of the surface potential after progress was large for 50 seconds, and it was that to which static electricity is arisen and charged on a front face.

[0112]

[Effect of the Invention] Since it depends contact member 30 and the oxide film concerned is broken through also when the oxide film is formed in the front face of the electrode for connection according to the anisotropic conductive sheet of this invention, since the contact member 30 is formed in the front face of the track formation section 11 in the body 10 of an anisotropic conductive sheet, the electrical installation between the electrode for connection and the track of the body 10 of an anisotropic conductive sheet is attained certainly. Furthermore, in case an anisotropic conductive sheet is removed from a circuit apparatus etc., there is also no generating of static electricity. For this reason, damage on inspected objects, such as an IC package, can also be prevented. Moreover, since there are few surface parts which the track formation section 11 in the body 10 of an anisotropic conductive sheet contacts directly to the electrode for connection, contamination of the front face of the electrode for connection by the low molecular weight constituent contained in the elastic high polymer which constitutes the track formation section 11 concerned is controlled.

[0113] Furthermore, since the thermocompression bonding of the contact member 30 can be carried out to the front face of the track formation section 11 in the body 10 of an anisotropic conductive sheet, even if it fixes with an adhesive property with a high contact member 30 to the track formation section 11,

consequently does not prepare a glue line the cable run formation section 11 and a contact member 30 concerned, and in between, a long use life is acquired. Moreover, degradation of a current carrying part can also be prevented and the endurance of an anisotropic conductive sheet can also improve. Since the electric discharge layer is furthermore prepared in the whole surface of a sheet object according to the anisotropic conductive sheet of this invention, it can prevent or control that static electricity is arisen and charged on the whole surface of an anisotropic conductive sheet by grounding the electric discharge layer concerned. Therefore, since it becomes unnecessary to interrupt inspection and to do the electric discharge activity of an anisotropic conductive sheet in using the anisotropic conductive sheet of this invention for electric inspection of circuit apparatus, such as a printed circuit board and a semiconductor integrated circuit, electric inspection of a circuit apparatus can be conducted at high time effectiveness. Moreover, depending on the approach of insulating processing, an electric discharge side and a grand (ground) side can be formed there, and it also becomes possible to perform strengthening of the further electrification prevention, a RF, and highly precise measurement. Moreover, a metal membrane can be given by forming very thin metal membranes, such as a spatter and plating, and field contact of PCR and the description of rubber called concavo-convex flattery nature are not lost in that case. Therefore, welding pressure can be used in the range which is not different from the condition of only rubber. Moreover, this anisotropic conductive sheet can be manufactured easily.
[0114]

[Translation done.]